AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of claims in the application.

Claim 1 (withdrawn): A semiconductor device comprising:

a semiconductor substrate;

a gate insulating film made of silicon oxynitride and disposed on a partial surface area of the semiconductor substrate;

a gate electrode disposed on the gate insulating film; and

source and drain regions disposed on both sides of the gate electrode,

wherein an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the gate insulating film is 20 % or smaller and wherein three bonds of each subject nitrogen atom are all coupled to silicon atoms and remaining three bonds of each of three silicon atoms connected to the subject nitrogen atom are all coupled to other nitrogen atoms.

Claim 2 (withdrawn): A semiconductor device according to claim 1, wherein a thickness of the gate insulating film is 3 nm or thinner.

Claim 3 (withdrawn): A semiconductor device comprising:

a semiconductor substrate;

a gate insulating film disposed on a partial surface area of the semiconductor substrate, the gate insulating film being a lamination of a silicon oxynitride film and a high dielectric

constant film disposed in an order recited, the high dielectric constant film having a higher dielectric constant than a dielectric constant of the silicon oxynitride film;

a gate electrode disposed on the gate insulating film; and

source and drain regions disposed on both sides of the gate electrode,

wherein an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the silicon oxynitride film is 20 % or smaller and wherein three bonds of each subject nitrogen atom are all coupled to silicon atoms and remaining three bonds of each of three silicon atoms connected to the subject nitrogen atom are all coupled to other nitrogen atoms.

Claim 4 (previously presented): A method of manufacturing a semiconductor device, comprising steps of:

forming a silicon oxynitride film on a surface of a semiconductor substrate;

forming a conductive film for a gate electrode on the silicon oxynitride film;

patterning the conductive film to leave a gate electrode; and

implanting impurities into semiconductor regions on both sides of the gate electrode to form source and drain regions,

wherein in the step of forming the silicon oxynitride film, the silicon oxynitride film is formed under the conditions that an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the silicon oxynitride film becomes 20 % or smaller and wherein three bonds of each subject nitrogen atom are all coupled to silicon atoms and remaining three bonds of each

of three silicon atoms connected to the subject nitrogen atom are all coupled to other nitrogen atoms; and,

wherein the silicon oxynitride film has a thickness of 3nm or less.

Claim 5 (original): A method of manufacturing a semiconductor device according to claim 4, wherein the step of forming the silicon oxynitride film comprises steps of:

forming a silicon oxide film on the surface of the semiconductor substrate; and

nitriding the silicon oxide film.

Claim 6 (original): A method of manufacturing a semiconductor device according to claim 4, wherein the step of forming the silicon oxynitride film comprises steps of:

forming a silicon nitride film on the surface of the semiconductor substrate; and

oxidizing the silicon nitride film.

Claim 7 (withdrawn): A method of evaluating the characteristics of a semiconductor device, comprising steps of:

forming a silicon oxynitride film on a surface of a semiconductor substrate;

measuring an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the silicon oxynitride film, wherein three bonds of each subject nitrogen atom are all coupled to silicon atoms and remaining three bonds of each of three silicon atoms connected to the subject nitrogen atom are all coupled to other nitrogen atoms; and

evaluating characteristics of a MISFET using the silicon oxynitride film as a gate insulating film, in accordance with the measured existence ratio.

Claim 8 (withdrawn): A method of evaluating the characteristics of a semiconductor device, comprising steps of:

forming a silicon oxynitride film on a surface of a semiconductor substrate;

measuring an energy spectrum of electrons on 1s orbital of nitrogen atoms in the silicon oxynitride film by using X-ray photoelectron spectroscopy;

separating a peak obtained by X-ray photoelectron spectroscopy into at least two first peaks on a higher energy side than an energy of electrons on 1s orbital of nitrogen atoms in silicon nitride and one second peak on a lower energy side than at least two peaks;

calculating a ratio of an area of the second peak to a total area of at least two first peaks and the second peak; and

evaluating characteristics of a MISFET using the silicon oxynitride film as a gate insulating film, in accordance with the calculated ratio.

Claim 9 (withdrawn): A process condition evaluating method comprising steps of:

forming a silicon oxynitride film on a surface of a semiconductor substrate;

measuring an existence ratio of subject nitrogen atoms to a total number of nitrogen atoms in the silicon oxynitride film, wherein three bonds of each subject nitrogen atom are all

coupled to silicon atoms and remaining three bonds of each of three silicon atoms connected to the subject nitrogen atom are all coupled to other nitrogen atoms; and

judging adequacy of a process condition of the step of forming the silicon oxynitride film in accordance with the measured existence ratio.

Claim 10 (withdrawn): A process condition evaluating method comprising steps of:

forming a silicon oxynitride film on a surface of a semiconductor substrate;

measuring an energy spectrum of electrons on 1s orbital of nitrogen atoms in the silicon oxynitride film by using X-ray photoelectron spectroscopy;

separating a peak obtained by X-ray photoelectron spectroscopy into at least two first peaks on a higher energy side than an energy of electrons on 1s orbital of nitrogen atoms in silicon nitride and one second peak on a lower energy side than at least two peaks;calculating a ratio of an area of the second peak to a total area of at least two first peaks and the second peak; and

judging adequacy of the step of forming the silicon oxynitride film in accordance with the calculated ratio.

Claim 11 (withdrawn): A semiconductor device comprising:

a semiconductor substrate;

a gate insulating film made of silicon oxynitride and disposed on a partial surface area of the semiconductor substrate;

a gate electrode disposed on the gate insulating film; and

source and drain regions disposed on both sides of the gate electrode,

wherein an energy spectrum of electrons on 1s orbital of nitrogen atoms in the gate insulating film is measured by using X-ray photoelectron spectroscopy; and a peak obtained by X-ray photoelectron spectroscopy is separated into at least two first peaks on a higher energy side than an energy of electrons on 1s orbital of nitrogen atoms in silicon nitride and one second peak on a lower energy side than at least two first peaks, wherein a ratio of an area of the second peak to a total area of at least two first peaks and the second peak is 20 % or smaller.

Claim 12 (withdrawn): A semiconductor device according to claim 11, wherein a thickness of the gate insulating film is 3 nm or thinner.

Claim 13 (withdrawn): A semiconductor device comprising:a semiconductor substrate;

a gate insulating film made of a lamination of a silicon oxynitride film and a high dielectric constant film disposed in an order recited on a partial surface area of the semiconductor substrate, the high dielectric constant film having a dielectric constant higher than a dielectric constant of the silicon oxynitride film;

a gate electrode disposed on the gate insulating film; and

source and drain regions disposed on both sides of the gate electrode,

wherein an energy spectrum of electrons on 1s orbital of nitrogen atoms in the gate insulating film is measured by using X-ray photoelectron spectroscopy; and a peak obtained by X-ray

photoelectron spectroscopy is separated into at least two first peaks on a higher energy side than an energy of electrons on 1s orbital of nitrogen atoms in silicon nitride and one second peak on a lower energy side than at least two first peaks, wherein a ratio of an area of the second peak to a total area of at least two first peaks and the second peak is 20 % or smaller.

Claim 14 (previously presented): A method of manufacturing a semiconductor device according to claim 4, wherein said existence ratio of subject nitrogen atoms to total number of nitrogen atoms in the silicon oxynitride film is in a range of 20 % to greater than 0%.

Claim 15 (new): The method of manufacturing a semiconductor device according to claim 4, wherein the step of forming a silicon oxynitride film on a surface of a semiconductor substrate comprises:

oxidizing a silicon substrate in an oxygen atmosphere to form a silicon oxide film; and

performing a heat treatment in NO gas at a gas pressure of 665Pa to 2660 Pa to introduce nitrogen atoms into the silicon oxide film to form a silicon oxynitride film.

Claim 16 (new): The method of manufacturing a semiconductor device according to claim 4, wherein the step of forming a silicon oxynitride film on a surface of a semiconductor substrate comprises:

oxidizing a silicon substrate in an oxygen atmosphere to form a silicon oxide film; and

exposing the silicon oxide film to nitrogen plasma or heat treatment performed in NO gas

to form a silicon oxynitride film.